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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/522,850	01/28/2005	Jun Jiao	VER-06-5438	1884

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## PATENT GROUP

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EXAMINER

MILLER, DANIEL H

ART UNIT

PAPER NUMBER

1775

DATE MAILED: 10/06/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/522,850

Applicant(s)

JIAO ET AL.

Examiner

Daniel Miller

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on Jan 17, 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-54 is/are pending in the application.
- 4a) Of the above claim(s) 30-48 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-6, 8-29, 49-52 and 54 is/are rejected:
- 7) ☒ Claim(s) 7 and 53 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 3, 17, 18, 22, and 27 are rejected under 35 U.S.C. 102(b) as being anticipated by Tada et al (U.S. 5,935,454).

Tada teaches a silicon substrate with silicon pillars (3). The silicon pillars are formed by dry etching (see figures), and have nucleation sites (2), which are considered a catalyst (see col. 6, lines 54-60 and example 2). The nanoscale structures are (4) the silicon condensation which occurs during dry etching (figure 1). Regarding claims 3, 17, 18, the pillars comprise silicon, as does the substrate (column 2 line 20-36). Regarding claim 22, multiple pillars may be present as shown in the figures. Regarding claim 27, the pillars have a diameter of 7-17 nm (see example 1).

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2. Claims 1-6, 8, 10-12, 13-16, 17-19, 22, 24, 26, 27, 28, 29, 49, 50, 51, 52, 54 are rejected under 35 U.S.C. 102(e) as being anticipated by Dai (6,401,526).

3. Dai teaches a substrate (figure 2) with a pillar structure and a catalytic island deposited on the pillar where a carbon nanotube is grown on the catalytic island (figure 2). The substrate is a silicon wafer (semiconductor, column 6 line 62-67). The pillars comprise silicone pyramids (column 5 line 30-35). It is noted that process language found in the claims such as "formed on" is not indicative of patentability of the product wherein the final product is taught by the art. Although the art does not directly teach the size of the nanotube AFM probe it is taught that it gets a resolution below 10 nm reading DNA molecules 2nm thick, which would inherently put the carbon nanotubes within applicant's claimed range (see column 6 and 7 generally).

4. Claims 1-6, 8, 10, 14-19, 50, 52, and 54 are rejected under 35 U.S.C. 102(e) as being anticipated by Mitchell (U.S. 6,457,350).

5. Mitchell teaches an atomic force microscope tip comprising a support structure (pillar) formed from a substrate with a nickel or iron catalyst and a carbon nanotube grown from the catalyst (abstract). The catalyst and the carbon nanotube have a flat surface of at least 15nm (abstract). The support structure (pillar) can be made from quartz or silica (column 4 line 50-58) and is an integral part of the substrate.

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dai ('526) in view of Mancevski (U.S. 6,146,227).

8. Dai ('526) are silent as to the diameter of the carbon nanotube grown on the pillar.

9. Mancevski teaches a similar device (AFM), where the nanotubes are 10 nm, within applicants claimed range (column 7 line 35-40)

10. It would have been obvious to a person of ordinary skill in the art at the time of the invention to use the same diameter nanotube in order to optimize the sensitivity and strength of the AFM probe.

11. Claims 20-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dai ('526) or Tada in view of Li et al (U.S. 6,831,017 B1).

12. The above-taught references are silent as to the nanostructure of claim 1 and 22 being a ZnO nanowire.

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13. Li teaches an array useful as sensor equipment or emitters for a display device (column 11 line 62-68). The device comprises a substrate with a catalyst layer and the array of ZnO nanowire (abstract and figure 1B). LI also teaches that the ZnO nanowires are a known substitute for carbon nanotubes used in above references (column 5 line 5-25).

14. It would have been obvious to one of ordinary skill in the art to modify the above teachings with the nanowires of Li since Li teaches that ZnO nanowires are a known substitute for carbon nanotubes in sensor emitter devices.

15. Claims 1, 9-10, 14, 22-26 and 28-29 rejected under 35 U.S.C. 103(a) as being unpatentable over Dai ('526) in view of Akiyama (U.S. 6,914,372 ).

16. Dai, discussed above is silent as to its use as an emitter for a display device.

17. Akiyama teaches a field emitter for a display device (abstract) comprising a substrate with the surface patterned (which could be a pillar) with a catalyst (abstract). The substrate has nanotube on patterned areas (abstract and figures). Akiyama further discloses that it is known in the art to use Tungsten tipped emitters and carbon nanotube emitters (column 1 line 45-55). Regarding claim 25, the emitters can comprise ZnO whiskers (nanorods) (column 28 line 24-31). Regarding claim 26, the whiskers help to form a gate electrode (column 28 line 35-45).

18. Therefore it would have been obvious to one of ordinary skill in the art to use a tungsten tipped (or doped) nanotube as an emitter in the manner as applicant claims

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because both tungsten and carbon nanotubes are used for the same purpose and their combinations would be predictably advantageous.

19. Claims 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dai ('526) in view of Brown (U.S. 6,297,063).

20. Dai, discussed above is silent as to the nanotube structure being used as a transistor with at least two terminals

21. Brown teaches a nanotube (wire) used as a transistor with at least two terminals

22. Therefore it would have been obvious to one of ordinary skill in the art to modify Dai with Brown because they have similar structures.

#### ***Allowable Subject Matter***

23. Claims 7, and 53 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

#### ***Response to Arguments***

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24. Applicant's arguments with respect to all pending claims have been considered but are moot in view of the new ground(s) of rejection. The affidavit has been considered and the Schlaf rejection has been withdrawn. The particularity of the Tada rejection have been more fully articulated and amended in view of amendment. It is noted that process language found in the claims such as "formed on" is not indicative of patentability of the product wherein the final product is taught by the art. Except for claim 49 none of applicant's claims require that the pillar and the substrate be different material or formed from separate parts. Therefore the rejections over Tada (amended) are maintained. Applicant argues that "nanoscale structures" is described in the specification as representative examples such as nanowires, noanotubes, etc. However, applicant has not defined "nanoscale structures" to be one of these articles therefore any structure may be considered a "nanoscale structure" in as much as applicant has defined the term.

### ***Conclusion***

25. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).



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A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Daniel Miller whose telephone number is (571)272-1534. The examiner can normally be reached on M-F.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jennifer McNeil can be reached on (571)272-1540. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Daniel Miller



JENNIFER C. MCNEIL  
SUPERVISORY PATENT EXAMINER  
9/20/06